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(54) MACHINE FOR PRODUCING LAMINATED EMBOSSED WEBS

(71) We, PAPER CONVERTING MACHINE COMPANY, INC. a corporation organised and existing under the laws of the State of Wisconsin, United States of America, of 2300 South Ashland Avenue, Green Bay, Wisconsin, United States of America, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the production of laminated embossed webs such as are used, for example, in towelling.

Embossed towelling has been made in the past by procedures such as are seen in U.S. Patent 3,414,459. Towelling of this nature has "peg-to-peg" projections or embossments which are developed through rotating embossing rolls in synchronism with a high degree of precision. This necessarily limits production because the nip defined by the embossing rolls must be carefully controlled. In addition, the width of the machine is necessarily limited because of the possibility of run-out" of the rolls, differential expansion and deflection along the length thereof due to dimensional differences which often are magnified during operation.

Through the provision of two embossing units plus a uniquely positioned laminator roll, we are simultaneously able to avoid the production limitations discussed above and at the same time provide a superior embossed laminate.

According to the invention, there is provided a machine for producing laminated, embossed webs comprising a frame, first and second embossing units mounted on the frame, each unit including an embossing roll having a pattern of projections, and a platen roll for coacting with each embossing roll, means for rotating the rolls, means at each embossing unit for

feeding a web into the nip between the embossing and platen rolls to develop two embossed webs, means for removing one of the embossed webs from its associated embossing roll and for passing the web in partial wrapping engagement with the other of the embossing rolls to superpose the embossed webs with the projections of one web intermediate the projections of the other web, means on the frame for applying adhesive to the projections of one of the webs and a third roll forming a nip with the embossing roll carrying the superposed webs to press both webs and adhere them together.

The invention also includes a method for producing laminated embossed webs comprising separately embossing two webs to form projections thereon, applying adhesive to at least some of the projections of one of said webs, orienting said webs so that the projections face each other and interlace with each other so as to provide air spacing between the webs, and applying laminating pressure to join said webs while one of said webs has the projections thereon supported.

The invention still further includes a laminated embossed web product comprising a pair of webs each equipped with a pattern of projections oriented with the projections facing each other and interlaced to provide discrete air spaces between the interlaced projections, the webs being united by means of adhesive applied to at least some of the high points of the projections of one of the webs.

The invention will now be further described with reference to the accompanying drawings, in which:—

Figure 1 is a fragmentary schematic view of the inventive machine as would be seen from one side;

Figure 2 is a reduced scale perspective view of the machine of Figure 1;

Figure 3 is a fragmentary plan view of the

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product issuing from the left-hand side of Figure 1, and corresponds to that seen along the sight line 3—3 applied to Figure 1;

Figure 4 is an enlarged scale fragmentary sectional view taken along the line 4—4 applied to Figure 3; and

Figure 5 is a fragmentary perspective view of the adhesive applicator roll seen in Figure 2.

In the illustration given, the numeral 10 generally designates a frame which is seen to include a pair of side elements for rotatably supporting a plurality of rolls. These rolls can be appreciated better from a consideration of FIG. 2 wherein a first embossing unit is made up of a platen roll 11 and an embossing roll 12. A second embossing unit consists of the embossing roll 13 and the platen roll 14. Each embossing roll 12 and 13 has a steel surface with a plurality of outwardly-extending projections formed thereon. The projections may number from 10 to 200 per square inch and may project upwardly from the surface from 0.01 inches to 0.05 inches whereby approximately 10% to about 75% of the surface of a web is embossed. For this purpose, the platen rolls may be covered with any suitable material currently used in the art, i.e., rubber as shown or paper etc. The platen rolls may also be made of steel with mating protrusions.

The numeral 15 designates a web issuing from an unwind stand (not shown) and passing around an idler roll 16 and thereafter into the nip defined by the rolls 11 and 12. The projections on the roll 12 develop corresponding projections 17 seen in the web 15 in FIG. 3. Adhesive is applied to some or all of the high points of these projections by means of the adhesive-applying unit generally designated 18 and which is seen to include a fountain 19 and a series of transfer rolls 20, 21 and 22 which are driven in conventional fashion. As seen in FIG. 5, the adhesive-applying roll 22 has provided thereon a pattern of raised surfaces as at 22a. This results in applying adhesive to less than all of the high points of the protrusions provided by the embossing unit which includes rolls 11 and 12. Through the use of a colored adhesive, a decorative eye-pleasing pattern can be produced — which is visible by the user of the web product. A certain amount of the adhesive penetrates through the web 15 to make the pattern visible and further, the web is generally at least translucent and almost transparent so that distinct color impressions can be obtained. For example, in the web product designated T in FIG. 3, six of the depressions as at 17a have been shaded to show a coloration in a generally hexagonal design. This is readily achieved through the use of suitably engraved plates on the plate cylinder applicator roll 22.

In analogous fashion, an upper web is designated 23 and is seen to be passing around an idler roll 24 before being embossed by the

coaction of rolls 13 and 14. The projections on the roll 13 develop corresponding projections in the web 23 — the developed projections being designated 25 in FIG. 3. Thereafter the webs are united in passing into the nip 26 defined by the rolls 12 and 27. The roll 27 is the so-called "laminator" roll and is seen to have a surface covered with resilient material 28 such as rubber having a hardness rating in the range of about 50 to about 90 Durometer A.

In the illustration given, a steel roll is employed for the laminator roll 27 and the covering was achieved through initially gluing a layer of specially-wrapped hard rubber-covered tape. The roll surface was then ground to present a smooth surface against the embossing roll 12. The pressure at the nip 26 was adjusted to the range of 50—60 pounds per linear inch which was satisfactory for the starch-adhesive used in laminating. Alternatively, a smooth steel roll could be employed as the laminator roll 27 — without any covering, but the thin, hard, rubber covering permits operation without the accuracy otherwise required insofar as run-out and straightness is concerned. The covering which in production machines may be of the order of one-half inch thick and 85 Durometer rubber eliminates the danger of mushrooming the small embossing elements on the roll 12 when the usual nip pressures are present. An additional advantage from the use of a resilient covered roll is the lack of a need for a separate drive. The numerous protrusions on the embossing roll 12 drive the laminator 27 without difficulty.

The web issuing to the left of the roll 27 is generally designated T and corresponds to that shown in FIG. 3. The adhesive which is applied only to the high points of the projections 17 results in glue bonds of the type designated 29 in FIG. 4. In some cases, the height of the projection 25 may be somewhat less so that a gap exists between the projection 30 and the confronting portion of the web 15. In any event, the projections 17 are rigidly supported during laminating.

As seen in FIG. 2, the plurality of rolls 11—14, 16 and 24 are all rotatably supported on the frame 10 as by means of suitable bearings, one of which is designated 31. The rolls are rotated in synchronism by means of gears 32 from a power source (not shown).

Referring again to FIG. 1, it will be noted that there is a distinct clearance between the rolls 12 and 13 which means that no problems of width limitation due to run-out, deflection, bearing heating, and the like are encountered as well as the fact that there does not have to be perfect register or synchronism between the rolls 12 and 13.

A wide variety of webs may be employed satisfactorily in the practice of the invention, depending upon the ultimate product. As illus-

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trated, the product may be toweling having a basic weight of about 7 to about 50 pounds per ream (3,000 square feet). Other webs such as film or foil may be employed, again depending upon the ultimate product. Products such as placemats, napkins, and the like are advantageously provided on the inventive machine. The roll 27 may have a diameter somewhat different from that of roll 12 so that the high points do not occur in the same position each revolution, providing, in effect, a "hunting" of the high points relative to the resilient covered roll 27.

It will be appreciated also that considerable leeway is provided in the embossing pattern. As is illustrated, the patterns in the two rolls are identical so that there is a perfect interlacing or nesting of the projections of one web relative to the projections of the other web. However, one web may have more of an "open" pattern of projection so that several projections on the other web will be accommodated during the interlacing. The projections may be circular, triangular, oval, hexagonal, diamond-shaped, or have any other of a multiple choice of shapes. Orientation of the pattern of the projections on the two webs may be similar or dissimilar as desired. Choice of shapes of the projections may be similar or dissimilar on the two webs. In any event, there is provided a unique nested-embossment type of web product where the nesting results in substantial bulk or air space and as can be appreciated from a consideration of FIG. 4 — in other words, the embossments in one web do not occupy all of the space between embossments in the other web. This additionally makes possible the development of the attractive color pattern through the selective application of adhesive and to this an additional advantage accrues in that less adhesive is required since only a predetermined number of protrusions receive adhesive.

While in the foregoing specification a detailed description of an embodiment of the invention has been set down for the purpose of illustration, many variations in the details hereingiven may be made without departing from the spirit of the claims.

WHAT WE CLAIM IS:—

1. A machine for producing laminated embossed webs comprising a frame, first and second embossing units mounted on the frame, each unit including an embossing roll having a pattern of projections, and a platen roll for coacting with each embossing roll, means for rotating the rolls, means at each embossing unit for feeding a web into the nip between the embossing and platen rolls to develop two embossed webs, means for removing one of the embossed webs from its associated embossing roll and for passing the web in partial wrapping engagement with the other of the embossing rolls to superpose the embossed webs with

the projections of one web intermediate the projections of the other web, means on the frame for applying adhesive to the projections of one of the webs and a third roll forming a nip with the embossing roll carrying the superposed webs to press both webs and adhere them together.

2. A machine according to Claim 1 in which the pattern has from 10 to 200 projections per square inch.

3. A machine according to Claim 1 or Claim 2 in which the third roll has a resilient covering.

4. A machine according to any of the preceding Claims in which the third roll has a different diameter from that of the first unit embossing roll.

5. A machine according to any of the preceding Claims in which the projections on the first unit embossing roll have a greater height than the projections on the second unit embossing roll.

6. A machine according to any of the preceding Claims in which the adhesive applying means includes a roll constructed to apply adhesive to only selected projections on one of the webs.

7. A machine according to any of the preceding Claims in which the adhesive-applying means includes a roll defining a predetermined pattern of raised surfaces for contacting and applying adhesive to the raised portions of an embossed web in the predetermined pattern.

8. A method for producing laminated embossed webs comprising separately embossing two webs to form projections thereon, applying adhesive to at least some of the projections of one of said webs, orienting said webs so that the projections face each other and interlace with each other so as to provide air spacing between the webs, and applying laminating pressure to join said webs while one of said webs has the projections thereon supported.

9. A method according to Claim 8 in which the embossing of the webs forms on each of them a pattern of the projections, the pattern having from 10 to 200 projections per square inch, each such projection having a height of 0.01 to 0.05 inches.

10. A method according to Claim 8 or Claim 9 in which the adhesive is applied to the projections of one of the webs while supporting that web on its associated embossing roll.

11. A laminated embossed web product comprising a pair of webs each equipped with a pattern of projections oriented with the projections facing each other and interlaced to provide discrete air spaces between the interlaced projections, the webs being united by means of adhesive applied to at least some of the high points of the projections of one of the webs.

12. A product according to Claim 11 in which the pattern has from 10 to 200 projec-

tions per square inch, each having a height of 0.01 to 0.05 inches.

- 5 13. A product according to Claim 11 or Claim 12 produced by a method according to any of Claims 8 to 10 using a machine according to any of Claims 1 to 7.

14. A method for producing laminated embossed webs, substantially as described.

- 10 15. A machine for producing laminated embossed webs, substantially as described with

reference to the accompanying drawings.

16. A laminated embossed multi-ply web product manufactured substantially as described with reference to the accompanying drawings.

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